NATIONAL UNIVERSITY OF ENGINEERING

COLLEGE OF GEOLOGICAL, MINING AND METALLURGICAL ENGINEERING

MINING ENGINEERING PROGRAM

MI872 – SURFACE MINING EXPLOITATION METHODS

I. GENERAL INFORMATION

CODE	**:**	MI872 Surface Mining Exploitation Methods
SEMESTER	**:**	8
CREDITS	**:**	5
HOURS PER WEEK	:	7 (Theory–Practice)
PREREQUISITES	**:**	MI753 Underground Mining Exploitation Methods MI742 Rock Mechanics
CONDITION	**:**	Compulsory
DEPARTMENT	**:**	Mining Engineering

II. COURSE DESCRIPTION

The course prepares students for understanding and applying the concepts and methods of surface mining in which soil and rock overlying mineral deposit are removed, in contrast to underground mining, in which the overlying rock is left in place and the mineral removed through shafts or tunnels. Students analyze the different stages of a mine project (since initial exploration to closure plan) including mine preparation, cutoff grades, mine cycle, safety in surface mining, surface mine planning. Several surface exploitation methods are analyzed including strip mining, open-pit mining and mountaintop removal mining. Students select the most suitable method on the basis of deposit physical conditions, as well as technical, economic and environmental considerations.

III. COURSE OUTCOMES

At the end of the course, students:

1. Organize and analyze ore deposit data for decision taking.
2. Analyze mine drilling techniques.
3. Analyze blasting operations of rocks and minerals.
4. Analyze transport operations of ore and dismount.

IV. LEARNING UNITS

1. ECONOMIC FUNDAMENTALS

Costas and benefits of mining operations / Financial mathematics / Preparation of cash flow / Value of money in time.

2. SURFACE MINING AND DRILLING

Drilling techniques on surface mining / Physical, geological and mechanical properties of rocks and mineral / Details of design and operation of the drilling machines / Selection of drilling machines / Performance / Drilling costs.

3. ROCKS AND MINERALS BLASTING

Operations in rocks or minerals blasting / Features and properties of commercial explosives and blasting accessories / Danger and care in storage, handling and transport of explosives / Design of a blasting batch / Structural, physical, mechanical, and dynamic parameters / Safety standards / Algorithms and calculations.

4. OPERATIONS EQUIPMENT

Ore loading uploading/downloading operations / Features and applicability of different available equipment and devices in industry, their parts and components / Operation and maintenance techniques / Production and uploading/downloading costs / Balance of loading and transport equipment based on accepted parameters to fulfill production programs.

5. TRANSPORT EQUIPMENT

Transport equipment and wheeled tracks / Technical characteristics, parts, components and control systems / Selection and maintenance of tires / Construction of roads and maintenance / Dismount-waste dump management / Compaction equipment and scrapers / Design of stable slopes according to its cohesion and angle of internal friction, humidity control and critical height.

V. LABORATORY AND PRACICE SESSIONS

1. Session 1: Prospection and new surface projects explorations in Peru. Mining Norm D.S. 065-EM, related to surface exploitation.
2. Session 2: Unit costs determination using conventional equipment and mechanized methods.
3. Session 3: Cut-off grade sensibility test.
4. Session 4: Software application for the planning of surface mining.

VI. METHODOLOGY

The course is taught under the modality consisting of theory, practice and laboratory sessions. In theory sessions, the teacher presents concepts, theorems and applications. In practical sessions, different real-world problems are resolved and their solution analyzed. In laboratory sessions, a specialized simulation software is used to solve problems and analyze solutions.

VII. GRADING FORMULA

The Final Grade PF is calculated as follow:

PF = (EP + 2*EF) / 3

EP: Mid-term Exam EF: Final Exam

VIII. BIBLIOGRAPHY

1. R.L. PERUFOY.
   Construction Planning Equipment and Methods.
2. Dr. FRACK STERMOLE.
   Economic Evaluation and Investment Decision Methods, Colorado School Mines.
3. CUMMINS-GIVEN.
   SME, Mining Engineering Handbook.